

Figure S1. Complete data records for (A) event 20101103, (B) event 20081217, and (C) event 20110519. The selected representative records for the whole array are displayed in Fig. 1.

Figure S2. Comparison between the P data and synthetics for the model proposed by Savage (2012).

Figure S3. Sensitive test for models with different slab heterogeneities characterized by different a_x , a_z , and σ_p in von Kármán distribution function. The numbers on top of synthetics frames are width of the slab, a_x , a_z , and σ_p .

Figure S4. Test for the attenuation effects. Comparing to the model without considering attenuation (A), an attenuated model (B) shows significant amplitude drop, especially at the smaller distance while rays sample the low-Q mantle wedge. (C) shows the same seismograms in (B) but with amplitude amplified by 2. Note the waveforms in (C) are almost identical as those in (A) at distance larger than 0.6° . The red dash line in (A) displays the LVL trapped high frequency arrivals, which is not shown for the attenuated model.

Figure S5. Comparison between the synthetics without and with attenuation. The attenuation is added by applying t^* correction assuming $Q = 700$.

Figure S6 Spectrograms for the data and synthetics for models with different slab heterogeneities characterized by different a_x , a_z , and σ_p .

Figure S7. Sensitive test for models with different extended depth of the LVL.

Figure S8. Sensitive test for models with different width of the slab.

Figure S9. Sensitive test for models with different slab dipping angle.

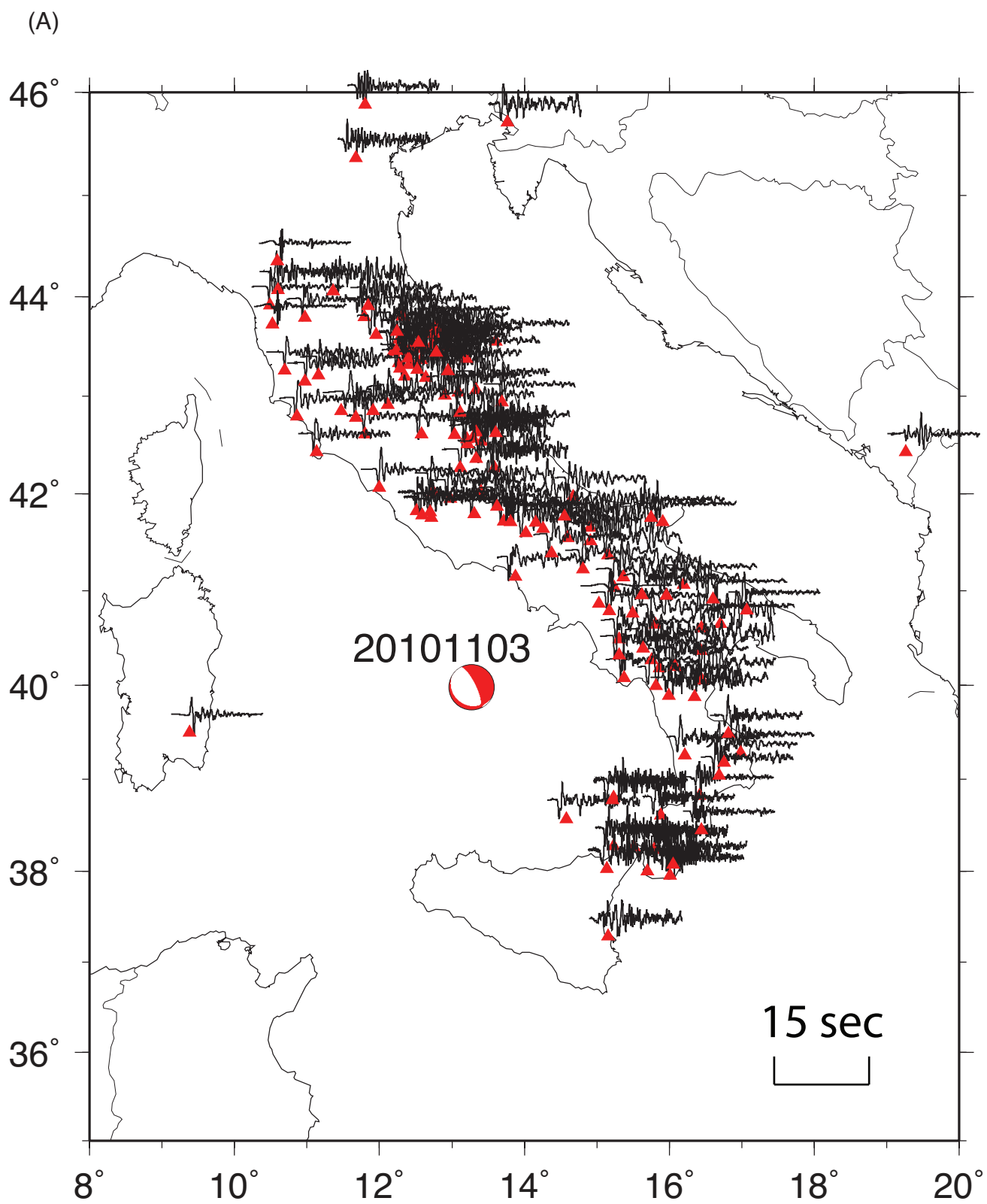


Figure S1

(B)

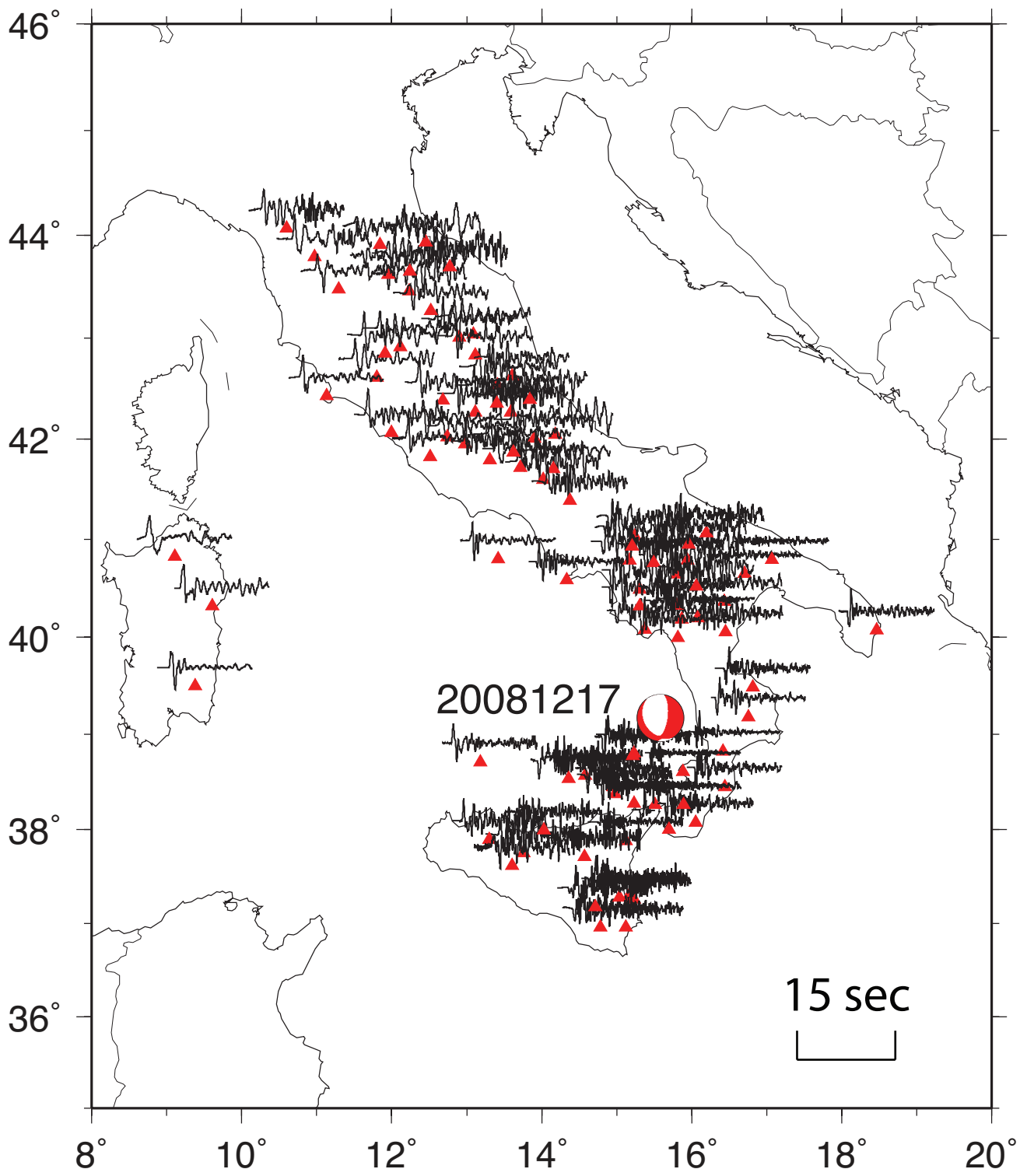


Figure S1

(C)

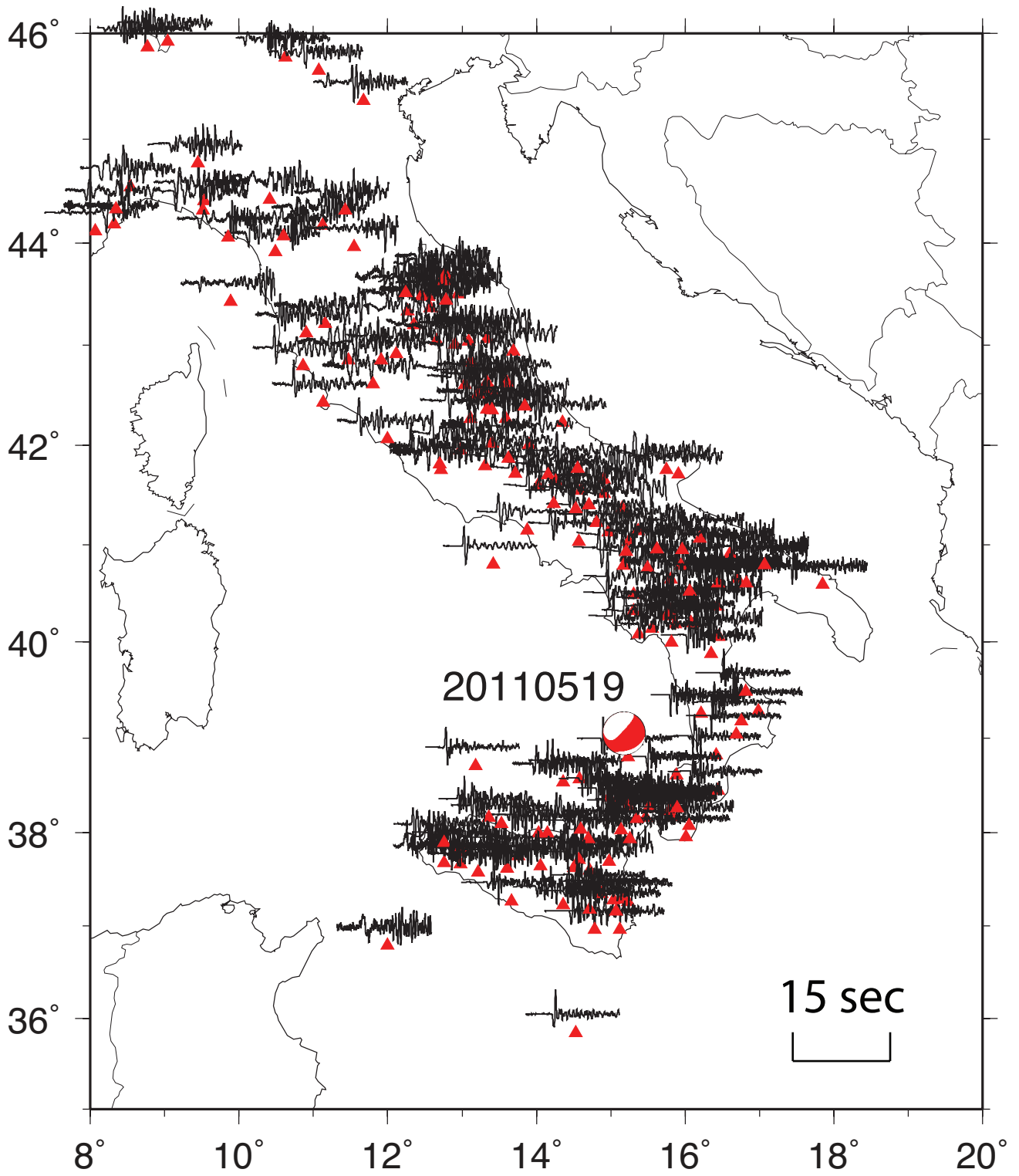


Figure S1

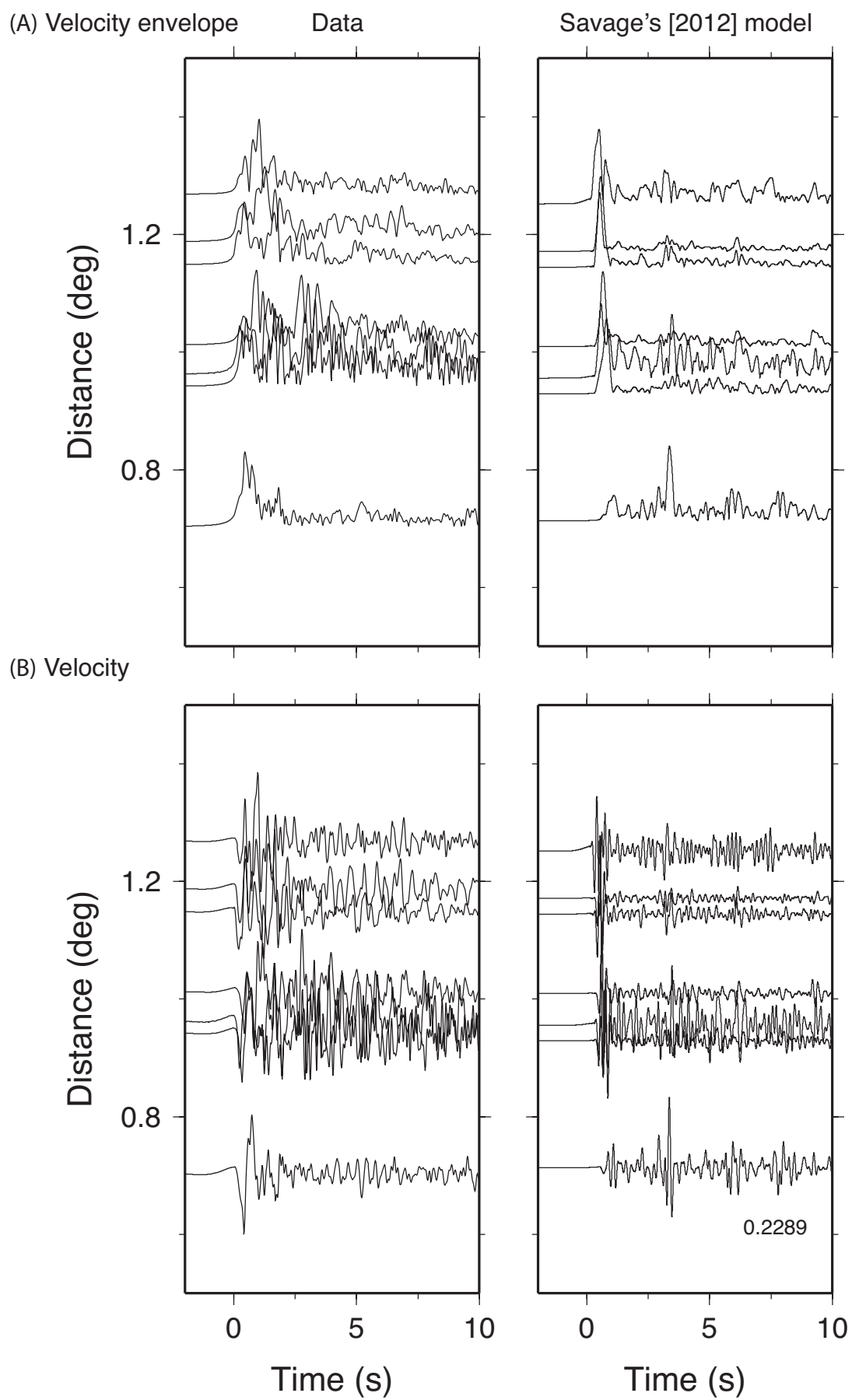
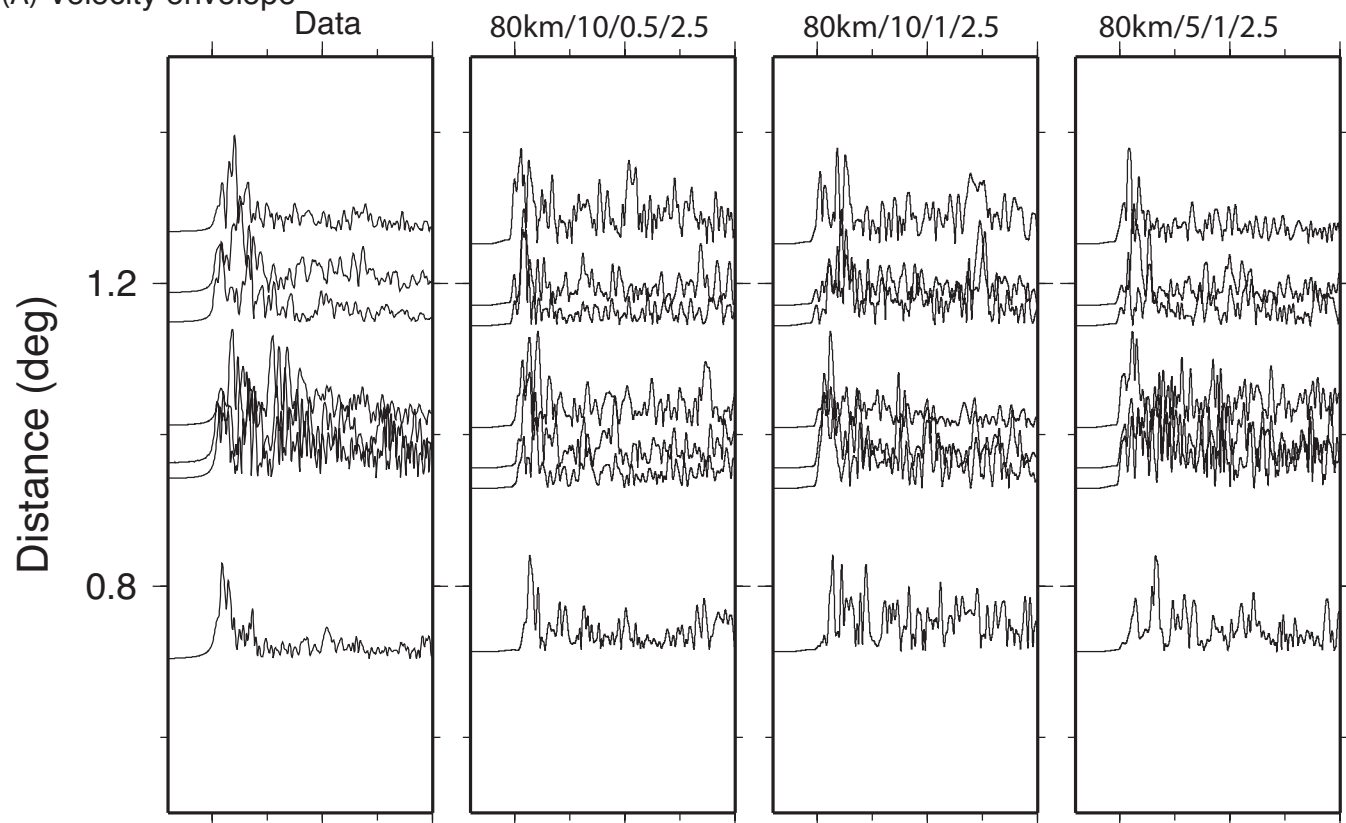


Figure S2

(A) Velocity envelope



(B) Velocity

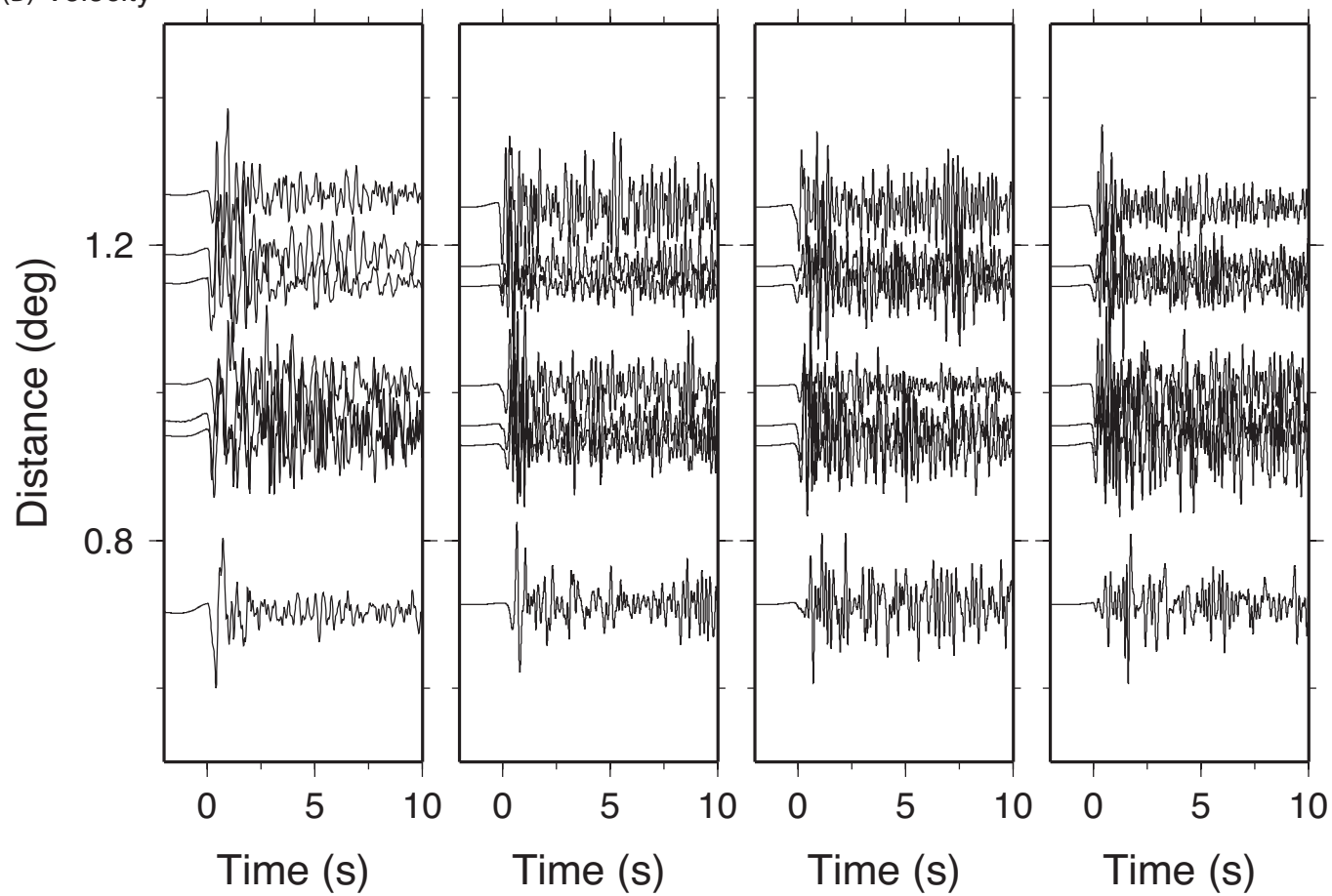
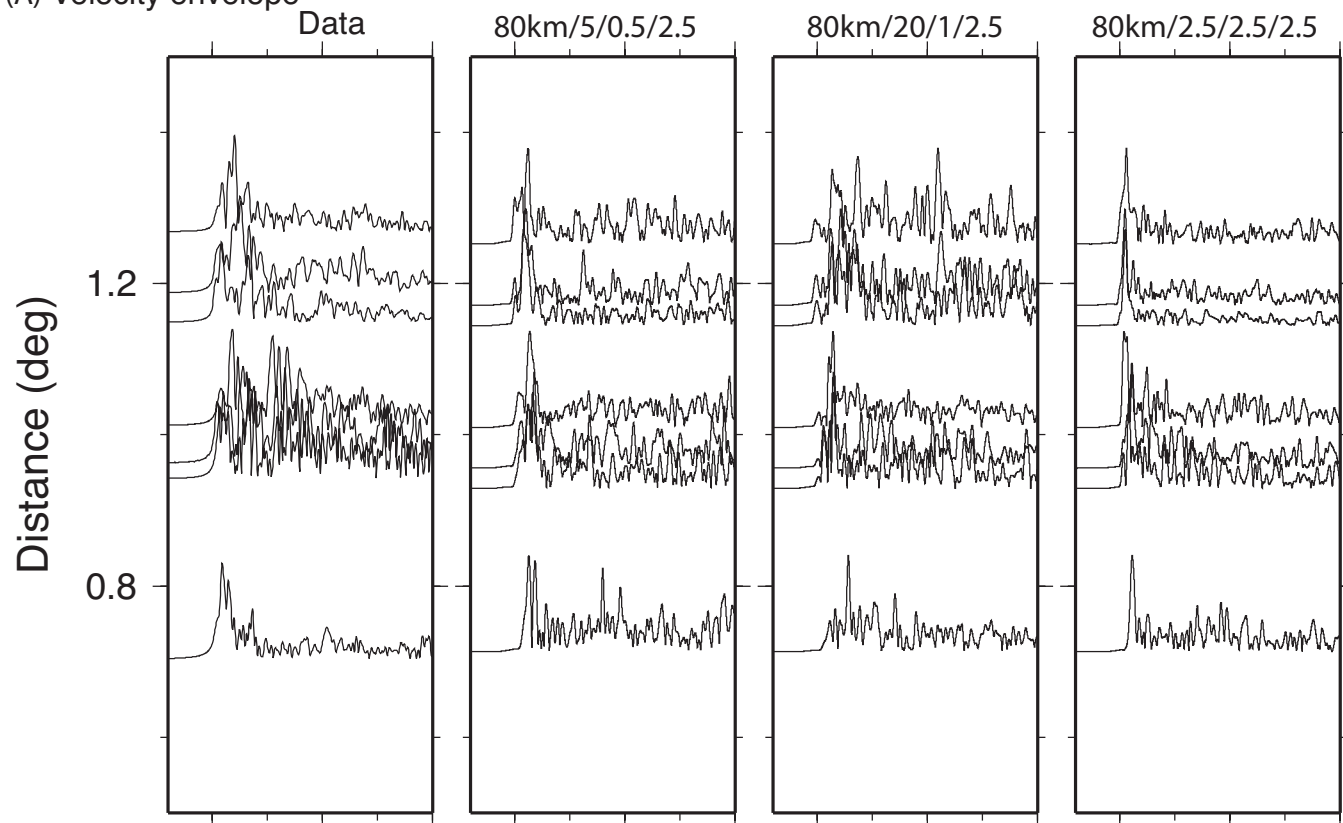


Figure S3

(A) Velocity envelope



(B) Velocity

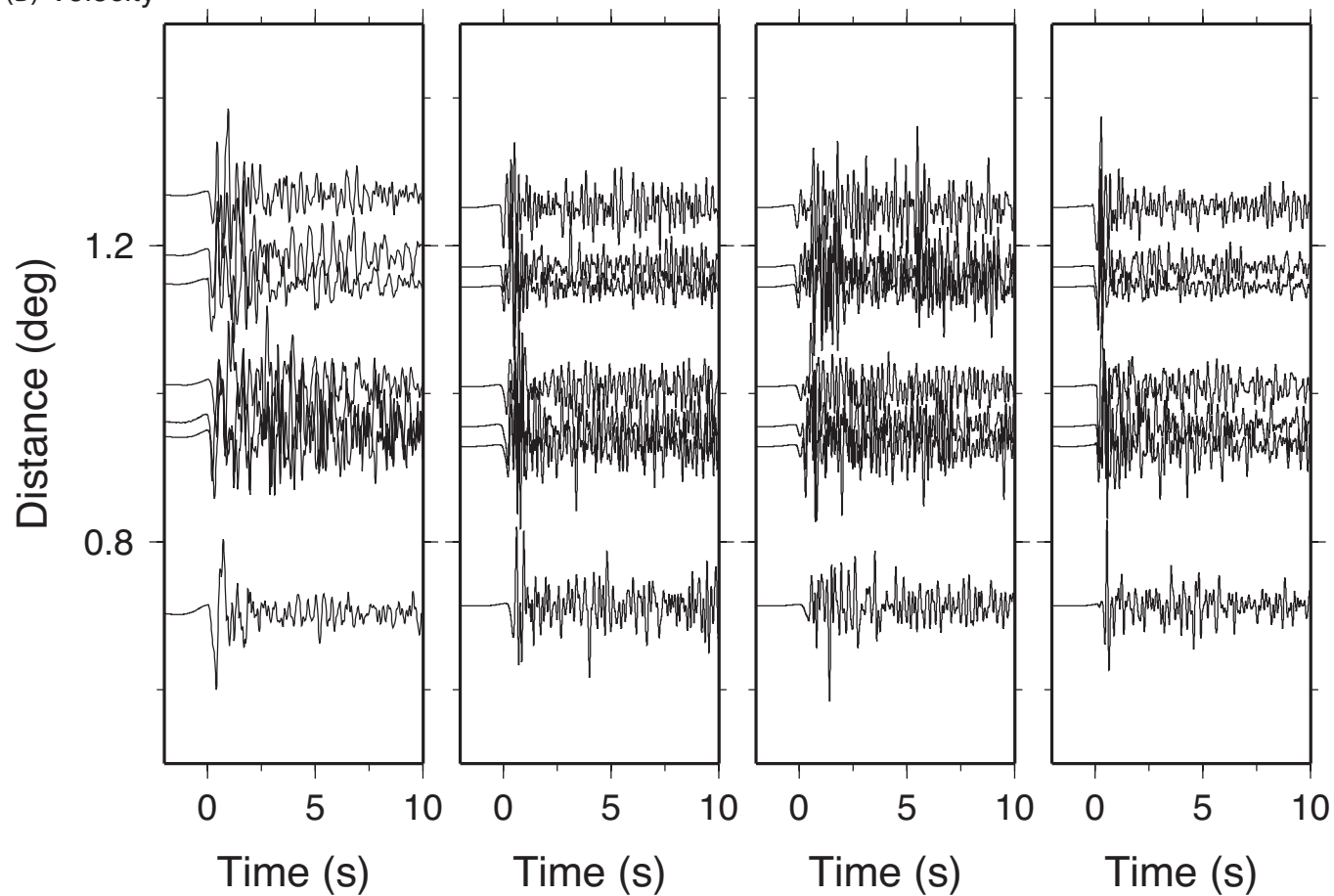


Figure S3
continued

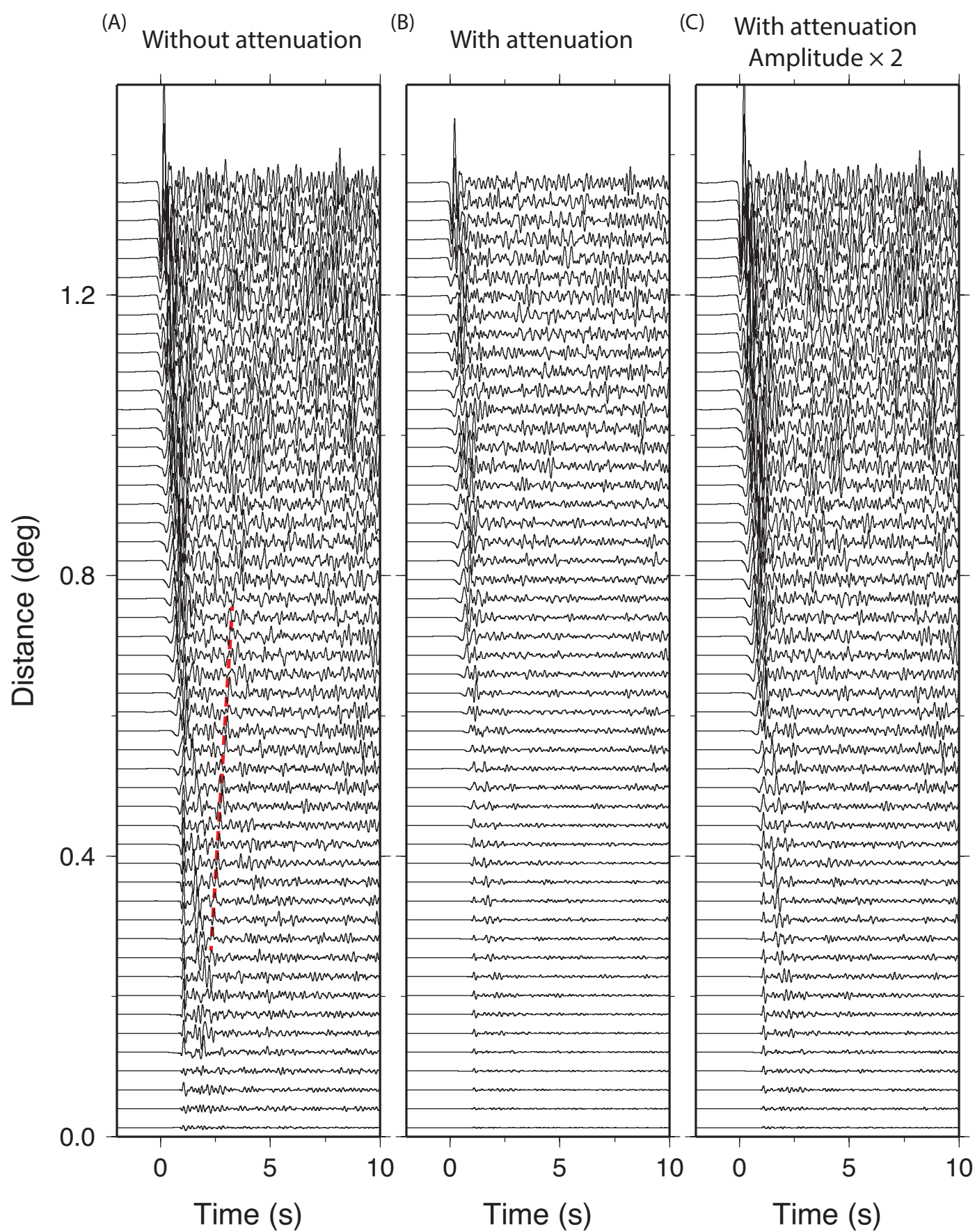


Figure S4

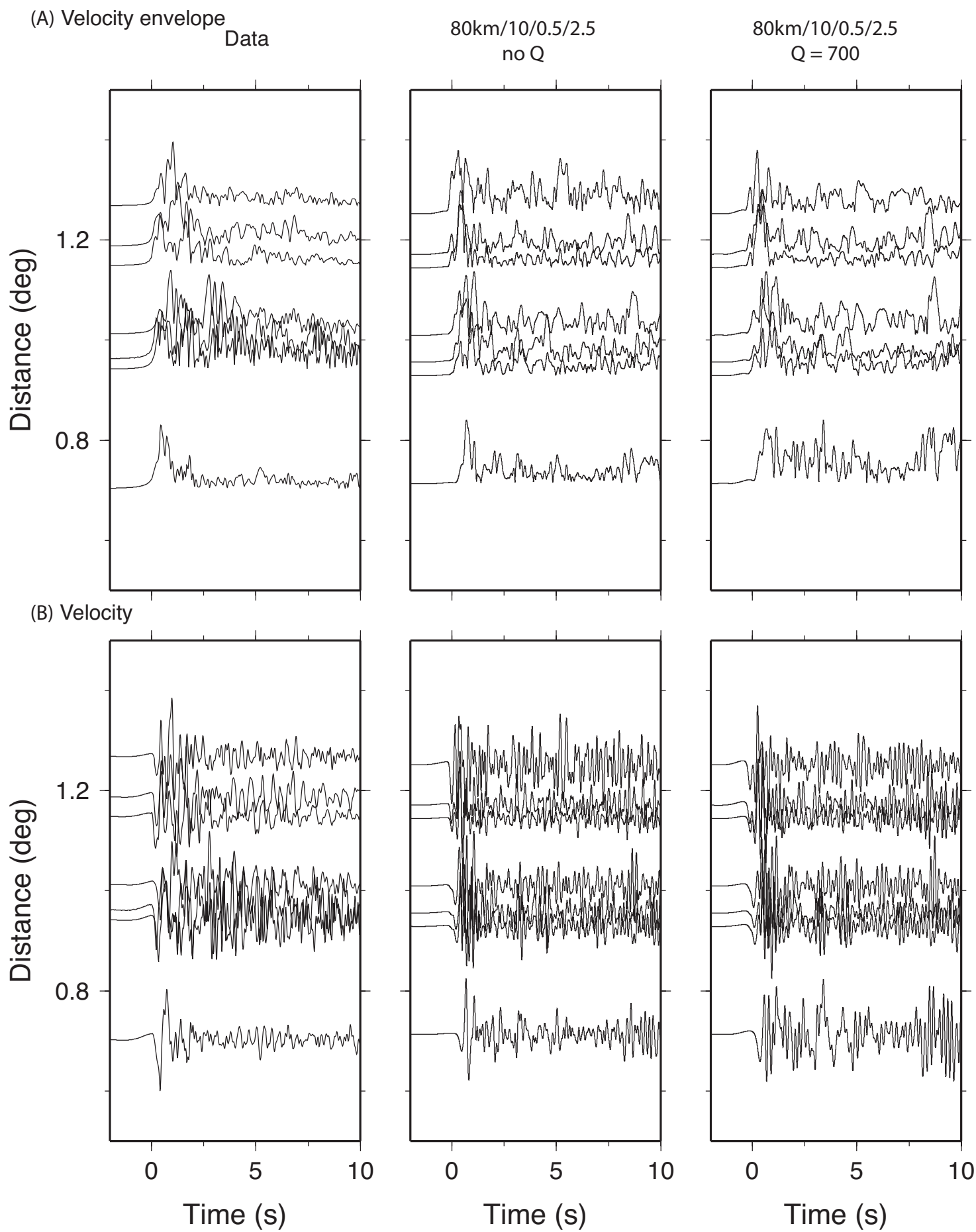


Figure S5

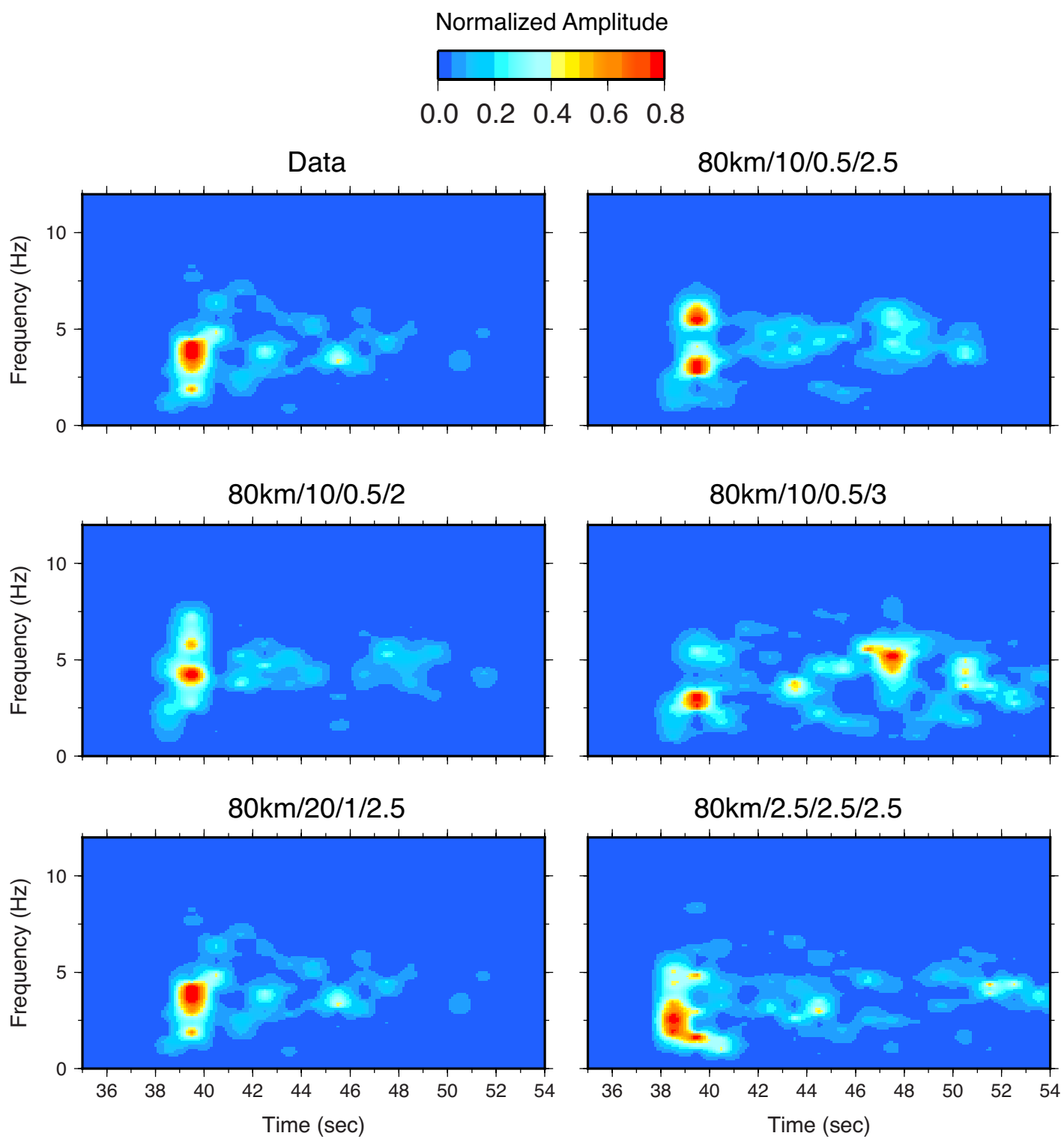


Figure S6

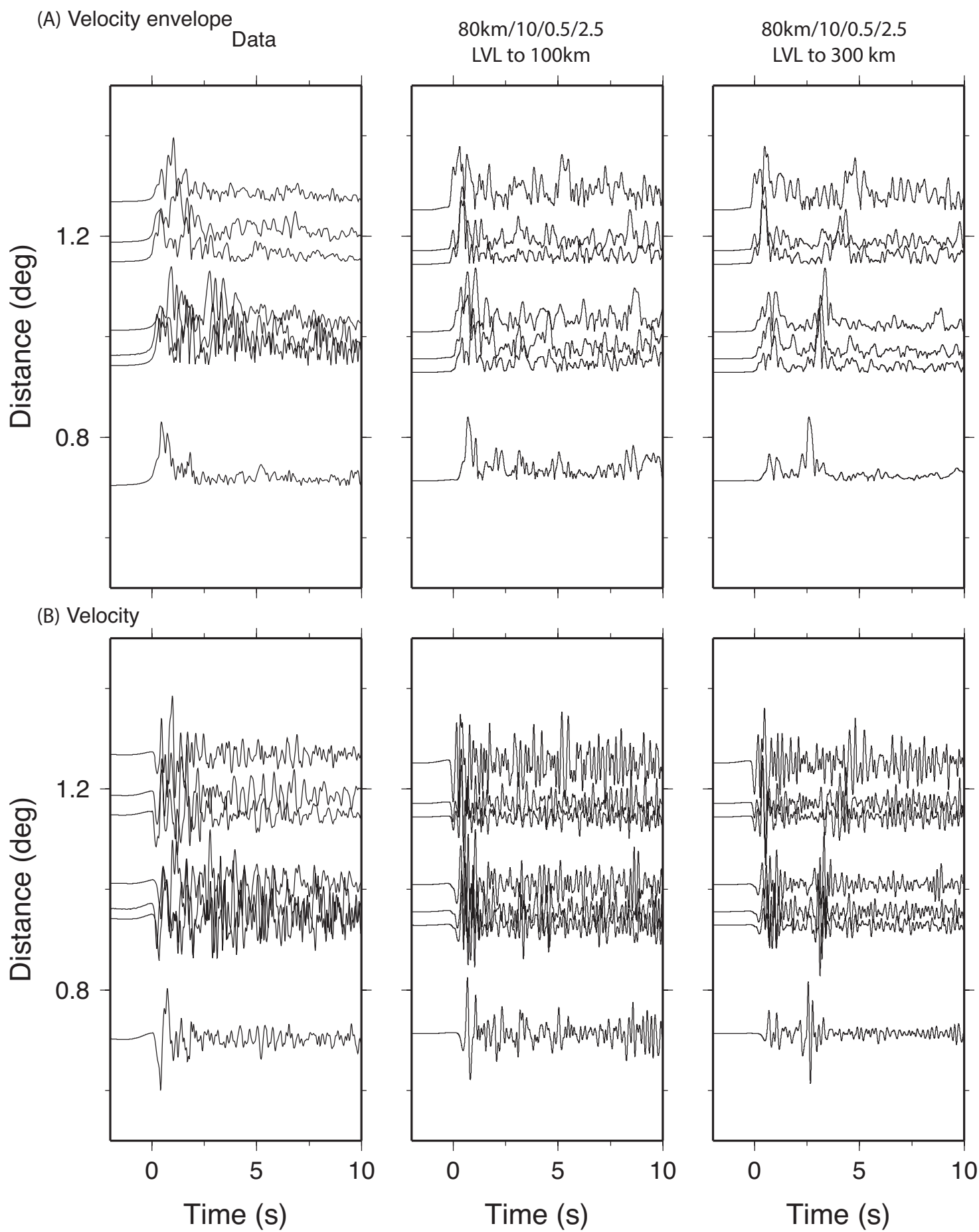
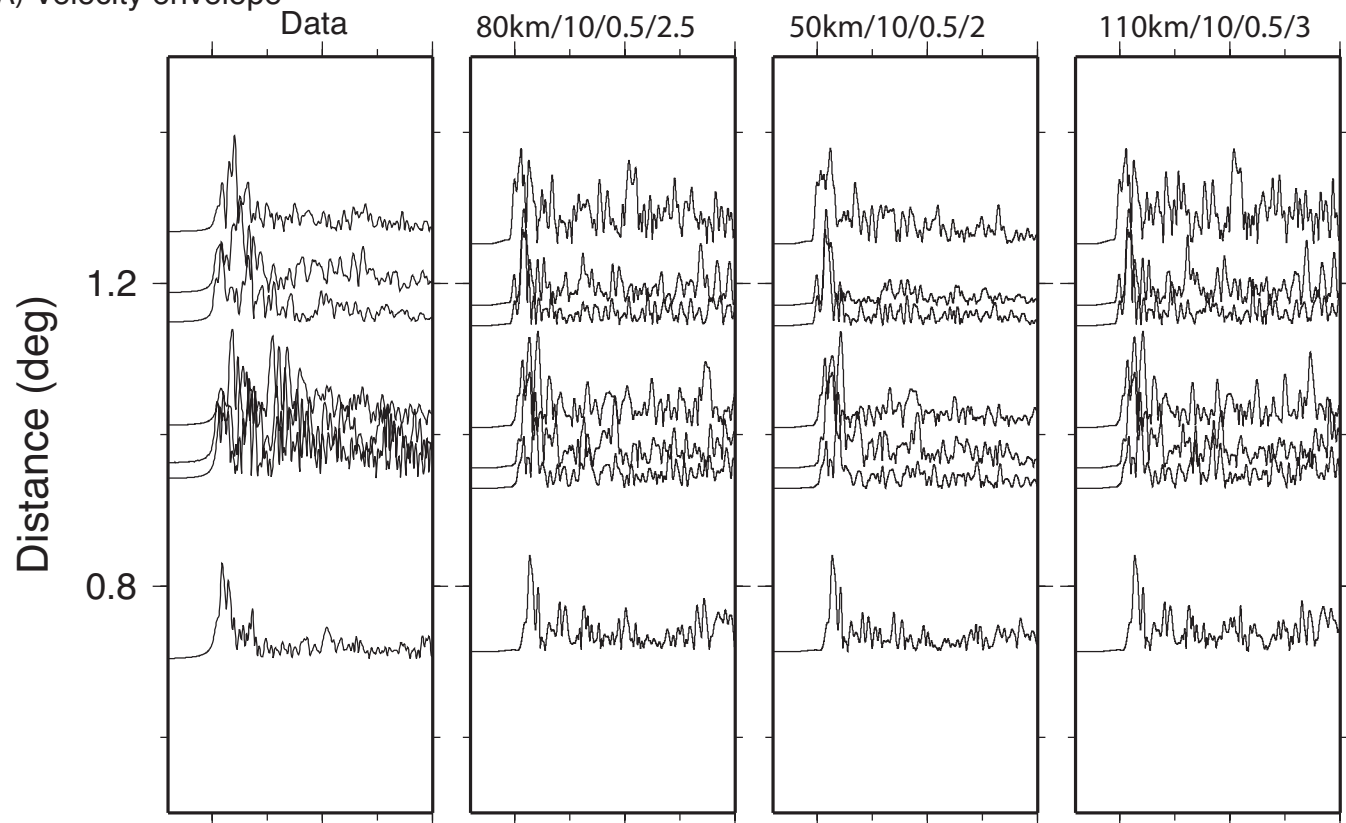


Figure S7

(A) Velocity envelope



(B) Velocity

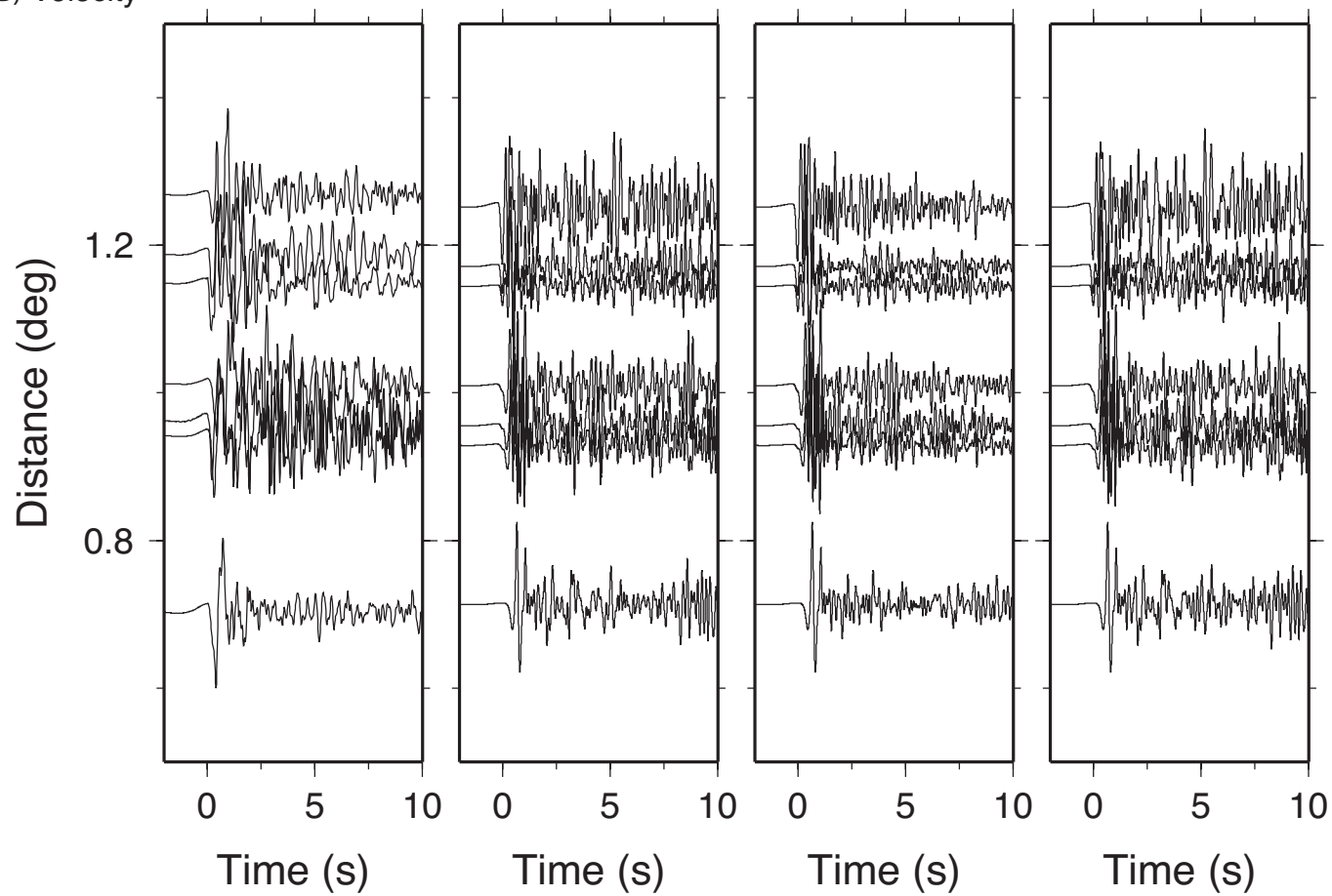


Figure S8

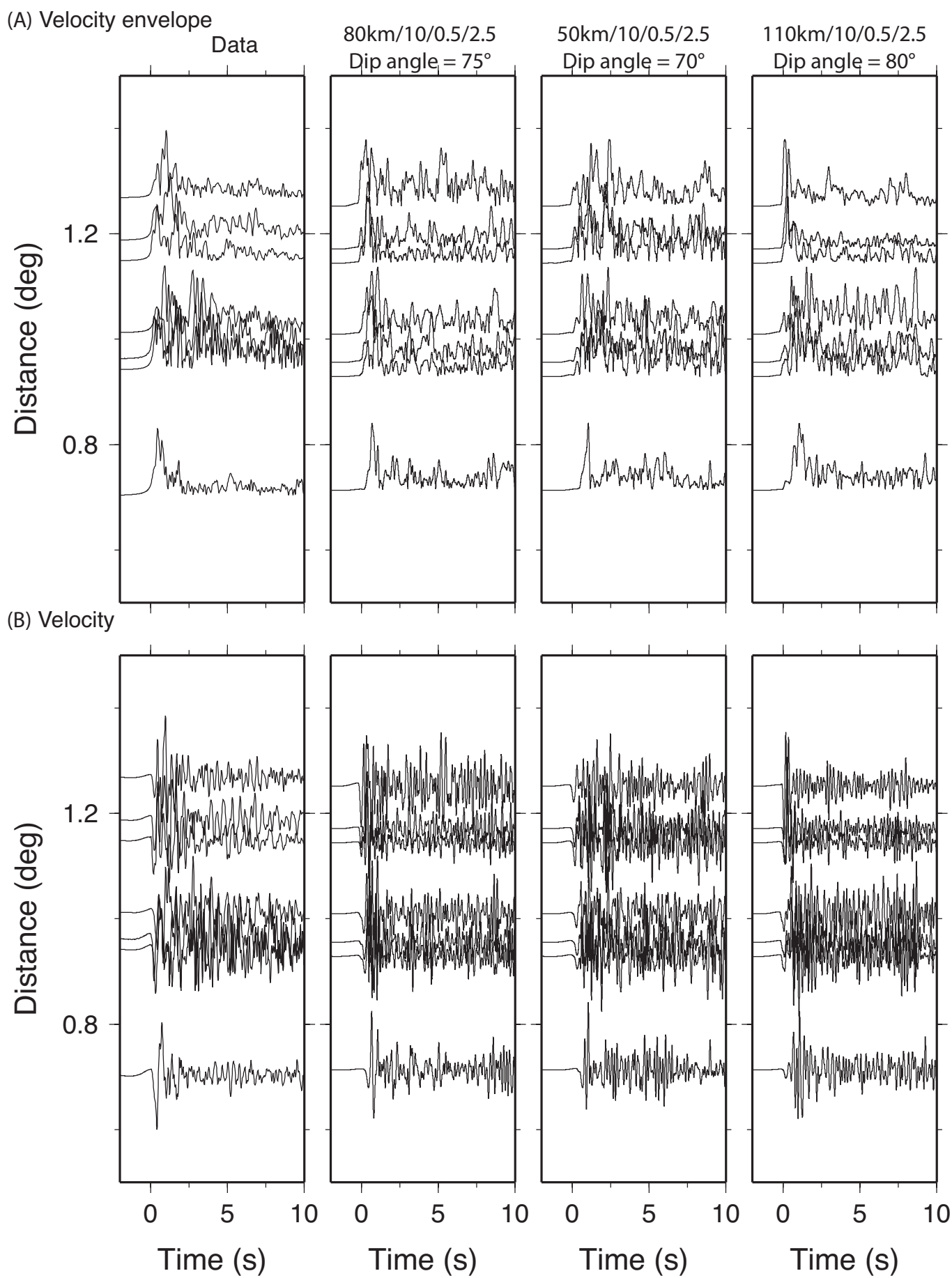


Figure S9